



**A Report to the
Audit Committee**

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Megan Barry

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Metropolitan
Nashville
Office of
Internal Audit

**Audit of Metro Nashville Public
Works Department Traffic
Signalization Improvement Projects -
Interim Report One**

December 8, 2016

AUDIT OF METRO NASHVILLE PUBLIC WORKS DEPARTMENT TRAFFIC SIGNAL OPTIMIZATION PROJECT – INTERIM REPORT ONE

EXECUTIVE SUMMARY

December 8, 2016



Why We Did This Audit

To help ensure traffic issues are improved through the successful completion of the Traffic Signal Optimization Projects.

What We Recommend

- Define measures of success to determine whether the investment in the project is justified.
- Maintain an inventory of the keys to the signals' controller boxes.

BACKGROUND

Metro Nashville Public Works Department initiated two projects in 2015 to improve congested traffic areas in the County. One is to replace obsolete equipment with one of newer technology, and the other to implement optimized signal timing along with new traffic studies for eighteen major street corridors. The total budget for these projects is \$6 million. The engineering work began in February 2016, and the signal timing optimization is expected to be completed by the end of 2016, with the final timing studies and a report from the engineer to be done by spring 2017. These two projects are within budget and on time as of November 7, 2016.

Exhibit 1 – Project Status as of November 7, 2016

Activity	Plan	Completed
Street Corridors	18	15
Traffic Signals Retimed	550	475
Retiming Completion Date	Fall 2016	In progress
New Controllers for the 18 Corridors	511	436
New Controllers elsewhere	289	10
Controller Installation Completion Date	Spring 2017	In progress
	Budget	Actual
Project Cost	\$6.03 million	\$2.93 million

Source: *Signal Group Assignments and Priority List 2016 MPW Countywide Signal Timing Optimization Project*; See Appendix A. *Public Works Traffic Signal Operation* provided the budget information.

OBJECTIVE AND SCOPE

The objective of this audit is to assess whether Metro Nashville Public Works Department is managing stakeholders and project risks for the projects to improve traffic signalization. The *Project Management Body of Knowledge Guide* knowledge areas "Project Stakeholder Management" and "Project Risk Management" served as a guideline for the audit.

The audit covers the traffic signal equipment upgrades that began in 2015 and the signal timing optimization project that began in 2016.

WHAT WE FOUND

The Public Works project team is working with consultants to the completion of these projects. However, the measure of project success was not formally defined. Moreover, management did not maintain an inventory of the keys to the signal control cabinets.

OBJECTIVES AND CONCLUSIONS

1. *Is the project team using a generally recognized set of good practices to help ensure the project is successful?*

Generally, Yes. The projects should be successful because the team consists of employees and contractors experienced in completing projects of this scope and type. However, areas listed below should be improved before the completion of projects.

Supporting Objectives and Conclusions

- a) *Did the Traffic Signal Operation manage stakeholder expectations?*

Generally, Yes. Although a 10 percent improvement in traffic throughput was loosely expected, the measure of success was not formally defined. The citizens cannot determine whether the investment in the project is justified without specific benchmarks, measures of success. (See Observation A.)

- b) *Did the Traffic Signal Operation Properly Manage the Project Risk?*

Generally, Yes. Control over the physical access to the controller cabinets can be further improved. Management did not maintain a proper inventory of the keys to the controller boxes. (See Observation B.)

AUDIT OBSERVATIONS

Internal control helps entities achieve important objectives and improve performance. The Committee of Sponsoring Organizations of the Treadway Commission (COSO), *Internal Control-Integrated Framework*, enables organizations to effectively and efficiently develop systems of internal control that adapt to changing business and operating environment, mitigate risks to acceptable levels, and support sound decision making and governance of the organization. The audit observations listed are offered to assist management in fulfilling their internal control responsibilities.

The audit observations are based on best practices in the *Project Management Body of Knowledge Guide*. These principles are recognized as good practice. “Generally recognized” means the knowledge and practices described apply to most projects most of the time, and there is a consensus about their value and usefulness. “Good practice” means there is general agreement that the application of the knowledge, skills, tools, and techniques can enhance the chances of success over many projects, per the *Project Management Body of Knowledge Guide*.

Observation A – Project Success Criteria

There is no written measure of project success criteria defined. Although the contract with the engineer who is performing the timings specifies a benefit-cost calculation must be made, the contract does not specify a minimum reduction in travel time that must be achieved or any other measure of success. Per discussion with the project manager and the traffic supervisor, an average 10 percent improvement overall in traffic times is loosely regarded as a success.

Stakeholder management is developing management strategies to consider the stakeholder needs throughout the project's lifecycle. Strategies include, but are not limited to, obtaining their commitment to the success of the project and confirming it as the project continues, and managing stakeholder expectations. Without a firm measure of success or benchmark, management cannot demonstrate to the stakeholders that the investment in the project was justified.

Criteria:

- *Project Management Body of Knowledge Guide, Chapter 2 “Organizational Influences and Project Life Cycle,”*

Section 2.2.2 Project Governance, states, “Examples of the elements of a project governance framework include project success and deliverable acceptance criteria.”

Section 2.2.3 Project Success states, “The success of the project should be measured in terms of completing the project within the constraints of scope, time, cost, quality, resources, and risk as approved between the project managers and senior management.”

- COSO Principle 6 - The organization specifies objectives with sufficient clarity to enable the identification and assessment of risks relating to objectives.

Recommendations for management of Metro Public Works Department to:

1. Work with the vendor to determine an acceptable success measure to justify spending for the project.
2. Adopt a methodology to establish a reasonable expectation of traffic improvement through benchmarking, traffic data collection, and analysis, and public input.

Observation B – Physical Access to Traffic Signal Control Cabinets

The existing inventory of the keys to control cabinets should be improved. Lock assemblies of all cabinets are rekeyed by a contracted Metro vendor, who also provides a certain amount of new keys. Each key has the inscription of “Do not duplicate.” There is a procedure in place to log key distribution. However, the total number of keys available is unknown. Without a complete inventory of the keys, including the beginning number of keys, keys issued and returned, and proper accountability, the risk of unauthorized physical access to the controller cabinets is increased.

Criteria:

- *Project Management Body of Knowledge Guide, Chapter 11, “Project Risk Management” states, “Project risk management includes the processes of conducting risk management planning, identification, analysis, response planning, and controlling risk.”*
- COSO Principle 10 - The organization selects and develops control activities that contribute to the mitigation of risks to the achievement of objectives to acceptable levels.

Recommendations for management of Metro Public Works Department to:

Improve the method of inventory of the control cabinet keys, by establishing a complete count of keys, keys issued and returned sign-offs.

GOVERNMENT AUDITING STANDARDS COMPLIANCE

We conducted this audit in accordance with generally accepted government auditing standards. Those standards require that we plan and perform the audit to obtain sufficient, appropriate evidence to provide a reasonable basis for our findings and conclusions based on our audit objectives. We believe that the evidence obtained provides a reasonable basis for our observations and conclusions based on our audit objectives.

METHODOLOGY

To accomplish our audit objectives, we performed the following steps:

- Interviewed key personnel within Public Works.
- Reviewed and analyzed documentation for compliance with the Tennessee Code Annotated, Metropolitan Nashville Code of Laws, and other applicable laws, regulations, and policies.
- Performed inquiries and reviewed documentation to determine the extent of compliance with the *Project Management Body of Knowledge Guide* knowledge areas.
- Evaluated internal controls currently in place.
- Reviewed The Committee of Sponsoring Organizations of the Treadway Commission (COSO), *Internal Control-Integrated Framework*.
- Considered risk of fraud, waste, and abuse.
- Considered information technology risks.

AUDIT TEAM

Mark Swann, CPA, CIA, CISA, Metropolitan Auditor

Qian Yuan, CIA, CISA, ACDA, Quality Assurance

Mary Cole, CPA, CFE, CISA, CGFM, Senior Internal Auditor

APPENDIX A – SIGNAL GROUP ASSIGNMENTS AND PRIORITY LIST 2016

SIGNAL GROUP ASSIGNMENTS AND PRIORITY LIST
 2016 MPW COUNTYWIDE SIGNAL TIMING OPTIMIZATION PROJECT
 (Dates Tentative/Subject to Change)

Priority	Group	Team	Name	# of Signals	Cycle / Subsystem Assignment	Proposed Timings / TOD Plan	Database Programming (MPW)	Begin Field Implementation
1	9	1	Downtown CBD	85	7/11	8/8	8/15	8/22
2	2	1	KVB / Shelby Street / Woodland Street	39	7/18	8/15	8/22	8/29
3	3	2	21st Avenue South	17	7/25	8/22	8/29	9/5
4	4	2	West End Avenue / Harding Rd	48	8/8	9/5	9/12	9/19
5	5	3	Nolensville Road	45	8/15	9/12	9/19	9/26
6	1	1	Charlotte Pike	43	8/29	9/19	9/26	10/10
7	10	2	Hillsboro Road	21	8/29	9/26	10/3	10/10
8	8	1	Metro Center/Rosa Parks/Jefferson	26	9/5	10/3	10/10	10/17
15	15	1	Clarksville Pike	15	9/5	10/3	10/10	10/17
9	11	3	Harding Place	19	9/5	10/3	10/10	10/17
10	6	1	Lebanon Rd / Andrew Jackson Pkwy	53	9/26	10/10	10/17	10/24
11	12	1	Donelson Pike	7	9/26	10/10	10/17	10/24
12	7	2	Gallatin Pike	21 of 58 installed	9/19	10/17	10/24	10/31
13	13	3	Bell Road / Hickory Hollow	18	9/26	10/24	10/31	11/7
14	14	3	Haywood Lane	5	9/26	10/24	10/31	11/7
16	16	1	Highway 70 South	13	10/10	10/24	10/31	11/7
17	17	3	Franklin Road	15	10/3	10/31	11/7	11/14
18	18	3	Dickerson Road	23	10/3	10/31	11/7	11/14

550

*Groups 6/12 implementation may occur over 2 weeks (10/24 - 10/31)

*Group 7 implementation may occur over 2 weeks (10/31 - 11/7)

- 1-NSI
- 2-Volkert
- 3-RGP

Total signal timings implemented as of 11-7-16: 439

Source: Public Works Traffic Signal Operation



METROPOLITAN GOVERNMENT OF NASHVILLE AND DAVIDSON COUNTY

Megan Barry
Mayor

METRO PUBLIC WORKS
750 SOUTH 5th STREET
NASHVILLE, TENNESSEE 37206

December 8, 2016

Mr. Mark Swann
Metropolitan Auditor
Office of Internal Audit
404 James Robertson Parkway
Nashville, TN 37219

Re: Audit of the Metro Nashville Public Works Department Traffic Signalization Improvement Projects

Dear Mr. Swann:

This letter acknowledges the Public Works Department's receipt of the above referenced report. We have reviewed your observations and recommendations and have evaluated each for adoption in Metro Public Works' Traffic Signalization Improvement Plan. Actions will be taken as indicated in the Management Response.

We appreciate the methodology used in reviewing our processes, particularly the cooperative effort in developing the final report, and considering our input and concerns during the entire process.

Regards,

A handwritten signature in black ink that reads "Mark A. Sturtevant".

Mark Sturtevant

APPENDIX B – MANAGEMENT RESPONSE AND CORRECTIVE ACTION PLAN

We believe that the Metro’s Treasury and Accounting management is in a unique position to best understand their operations and may be able to identify more innovative and effective approaches. We encourage them to do so when providing their response to our recommendations.

Recommendations	Concurrence and Corrective Action Plan	Proposed Completion Date
<i>Recommendation for the management of the Metro Public Works Department to:</i>		
A.1 Work with the consultant to determine an acceptable success measure to justify spending for the project.	Accept.	April 2017
A.2 Adopt a methodology to establish a reasonable expectation of traffic improvement through benchmarking, traffic data collection, and analysis, and public input.	Accept.	April 2017
B.1 Improve the method of inventory of the controller cabinets’ keys, by establishing a complete count of keys, keys issued and returned.	Accept.	April 2017